

Gateway

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The ARRL Packet-Radio Newsletter

TAPR DISSATISFIED WITH NORD > <LINK'S RESPONSE TO TheNet ALLEGATIONS

In light of NORD > <LINK's response to allegations that TheNet is a direct copy of NET/ROM, the Board of Directors of Tucson Amateur Packet Radio (TAPR) has asked NORD > <LINK, the purveyors of TheNet, to return the Network Node Controller (NNC) software development system that TAPR had provided to NORD > <LINK.

At TAPR's annual Board of Directors meeting in February, Ron Raikes, WA8DED, the codesmith of NET/ROM, argued that TheNet firmware was a copy of NET/ROM. To support his allegations, Ron presented an independent analysis by Thomas Allen, WA6IGY, that substantiated WA8DED's claim (see *Gateway*, Volume 5, Number 11). After hearing Ron's presentation, the TAPR Board asked NORD > <LINK to respond to the issues raised in WA6IGY's evaluation.

NORD > <LINK's response was received recently and after evaluating it, the TAPR Board of Directors concluded that NORD > <LINK did not adequately address the issues raised and, as a result, the Board has asked NORD > <LINK to return the NNC software development system. According to TAPR president Andy Freeborn, NØCCZ, "The principle question raised appears in the WA6IGY conclusions (last paragraph) which states '...that TheNet is not an original development but rather a direct copy of NET/ROM.' It was the response to this allegation that the TAPR board sought. It was the reply to this allegation that did not satisfy the board."

PACCOMM INTRODUCES NEW PRODUCTS

One of the busiest booths at the 1989 Dayton HamVention was PacComm's, and for good reason, as Gwyn Reedy, W1BEL, and the folks from Tampa had a number of new packet radio products on display.

Two new TNCs, the PC-320 and TNC-320, were shown. The PC-320 is a 3/4-size plug-in card for the IBM PC and Tandy 1000 computer, while the TNC-320 is a traditional TNC in a cabinet for use with any EIA-232-compatible computer or terminal. Both TNCs support HF and VHF/UHF packet radio operation with a separate modem optimized for each type of signal. The VHF/UHF modem uses the TI 3105 modem IC, while the HF modem uses the EXAR 2206 and 2211 modem ICs with a 6-pole filter in the receive circuit. The TNC-320 also features a front panel threshold control to take advantage of the *hang* feature of its carrier detect circuit and a built-in LED tuning display.

An on-screen status display of the PC-320 was demonstrated at the booth by running a program provided with the TNC that simulates the ten-element HF tuning display and the conventional front panel LEDs found on a standard TNC. The status display can be moved to any position on the screen or made invisible while still

providing a connect alarm.

PacComm also displayed operating prototypes of their *Narrowband 96 Packet System* including the *Integrated Packet Radio* (IPR), which features PacComm's TINY-2 packet radio controller, a 9600-baud modem and a commercial-duty crystal-controlled RF deck built into a 3 X 6 X 7-inch enclosure. Also on display was the *NB96 Digital Radio*, which is an IPR without the TNC. It may be attached to the modem disconnect header of any TAPR-style TNC. A second model may be attached directly to the AEA PK-232 controller.

PacComm also displayed different models of their 2 X 3-inch *Ultraminature Packet Assembler/Disassembler* (UMPAD). One was installed inside a Toshiba 1000 laptop computer with a cable connecting it directly to a handheld transceiver. This unit was constructed by Fred de Bros, KX1S, and drew a crowd of interested spectators throughout the weekend. Development work on a production model of the laptop TNC is underway. Delivery date and which laptop computers will be supported is undecided at this time.

The *Personal Message System* (PMS), which is a self-contained mailbox on an optional EPROM that may be installed in any PacComm packet radio controller, now supports reverse-forwarding with WØRLI-type PBBSs. If the local PBBS SYSOP sets up forwarding files to deliver messages directly to user's PMS, the PMS will forward any outgoing messages to the PBBS during that connection, however, it will not initiate a connection to the PBBS in order to prevent excessive channel loading.

COMING BITS

NAPRA Packet Networking Forum

The Northwest Amateur Packet Radio Association (NAPRA) will hold the 1st Northwest Packet Networking Forum on Saturday, July 15 in the Seattle area. The purpose is to discuss ways to improve the network's operation and architecture today, tomorrow, and far into the future (see *Gateway*, Volume 5, Number 14, for more information concerning the forum's format).

The forum will be held at the Boeing Recreation Center, Room D, 22649 83rd Ave S, Kent, Washington. Doors open at 9 AM (coffee and donuts will be available) and the forum starts at 10 AM. Talk-in assistance may be obtained on the 145.33-MHz repeater. The meeting room is equipped with a PA system and an overhead projector. Please contact NAPRA if any special assistance is needed. The point of contact in NAPRA is Dennis Goodwin, KB7DZ, via mail: Apt #M4, 1748 Harrison Ave SE, Port Orchard, WA 98366; via telephone: 206-871-5818; via packet radio: KB7DZ @ KD7NM.

from Tad Cook, KT7H @ WS7M

This year's RSGB Data Symposium and AMSAT-UK Colloquium have been combined into Dataspace T89 and will be held July 27-31 at the University of Surrey in the United Kingdom. The International Space Assembly is scheduled for Thursday, July 27; the RSGB Data Symposium for Friday, July 28; the Combined Dataspace Tryst for Saturday, July 29; the AMSAT-UK Space Colloquium for Sunday, July 30; and the Satellites-in-Education Colloquium for Monday, July 31. All meetings will begin at 10 AM and end at approximately 6 PM.

In addition to the lecture program, there will be demonstrations of space and data communications equipment, RSGB bookshop and membership services, AMSAT-UK bookshop and services, two amateur stations (GB2SAT on HF and GB9AUK on satellite), tours of the UoSAT command station (on Friday and Saturday evenings), and weather and television satellite demonstrations. Further information and booking forms are available from Ron Broadbent, G3AAJ, AMSAT-UK, London E12 5EQ, UK or RSGB Headquarters, Lambda House, Cranborne Road, Potters Bar EN6 3JW, UK.

RESPONSE TO HERESY

Whether he meant it or not, WB4APR's message in *Gateway*, Volume 5, Number 15, has some deeper sides to it. First of all, the limit of the number of messages of importance approaches zero as the number of messages approaches infinity: this has always been and will probably always be true in our hobby. How many times have you listened to a conversation on SSB about the merits of dipoles versus verticals? The exception, of course, are those very important error-free emergency messages.

At the same time, with packet radio, the media *is* the message. We are all having just too much fun experimenting, and this is great. And finally, perhaps we should not kill the messenger - packet radio. What is really required is just a little more discipline on the part of the users, designers and manufacturers to improve level 1, operating habits, etc. And just as valid today as yesterday is Digi-Pete's concept of *packet radio poop*.

by Phil Anderson, WØXI

[Your *Gateway* editor met Phil at the Kantronics booth at the Dayton HamVention this year, where he was showing off the new Kantronics TM-1200 Telemetry Modem, which is another *real world* application of our packet radio hobby. The TM-1200 combines Kantronics' commercial packet radio modem with a traditional remote terminal unit (RTU) and is used to transfer data, such as temperature, pressure, water levels, etc, between remote locations, where the data is collected, and a central site via packet radio.]

FAST PACKET RADIO SYSTEMS

For some time now, I have been interested in the discussions going on regarding fast packet radio and data links using RF modems, specifically 9600-bit/s modems. There seem to be two schools of thought:

1) To use modems connected directly to transceiver IF strips and modulate the carrier directly with data.

2) To connect the data modem via the audio connections of the transceiver and operate in a similar way to the technique used on 3-kHz bandwidth telephone lines. A colleague of mine, J.T. Sandys, G8DXZ, and myself have proved that this technique works up to 9600 bit/s and we plan to try 14,400-bit/s modems soon.

The purpose of this article is to discuss the latter technique and (hopefully) stimulate some interest and maybe even some more experiments with these modems.

The Principles

Telephone modems, because of the transmission medium, must operate within a 3-kHz bandwidth. The frequency response of the telephone line is normally quoted as being between 400 Hz and 3400 Hz. Most people are familiar with normal frequency-shift keying (FSK) using two different tones as used in existing packet radio equipment, but to go much faster than 1200 bit/s within a 3-kHz bandwidth requires some further thought.

The first principle used is phase-shift keying (PSK) which uses one audio tone (the carrier) with phase changes introduced into this carrier which can be detected at the receiver. The advantage here is that one phase change can theoretically be introduced every cycle of the carrier and, if four types of phase changes are used, then two bits can be encoded per sampling time.

Secondly, amplitude changes can be added resulting in more combinations and more bits encoded per sample time. At this stage, we should introduce another piece of jargon, the *baud*. Baud is defined as the sampling time, ie the rate of phase and amplitude changes, for example, if four bits are encoded during every baud, and the *baud rate* is 1200, then the effective bit rate will be 4800 bit/s.

Given below is a table showing some half-duplex modulation techniques and their data rates.

Technique	Bit Rate	Baud Rate	Bits Per Baud	Phase Changes	Amplitude Changes	Carrier Frequency
V.29	9600	2400	4	8	1	1700
V.29	7200	2400	3	8	0	1700
V.29	4800	2400	2	4	0	1700
V.27	4800	1600	3	8	0	1800
V.27	2400	1600	2	4	0	1800

Another aspect of these modems is that of *training*. When data are sent, they are scrambled to make sure that all of the data points are sent even with no data being sent. This makes most efficient use of the transmitted spectrum. The receiving modem will synchronize to the transmitting modem, keeping track of the phase changes as the transmission goes on. This training does take some time however, and will cause time overhead if the channel is turned around frequently. The main reason for training using these patterns is to determine the phase and amplitude restrictions of the path and to set up an equalizer that is used to give a flat response during data transmission. The modems we have tried

also employ *adaptive equalization* which will adjust equalizer values during data transmission for small changes in the quality of the received signal.

The time taken to train may make transmissions using this faster data mode an overhead rather than an advantage if only small packets of data are sent. V.29, for example, needs 270 milliseconds (ms) to train before any data are sent, which is equivalent to about 40 characters of information at 1200 bit/s, therefore, we should send at least this amount of data and preferably more to take advantage of the higher data rate after training.

Below are some packet sizes and the times to transmit them using existing 1200 bit/s packet radio versus V.29 at 9600 bit/s.

Packet Size (chars)	Time @ 1200 bit/s	Time @ V.29/9600 bit/s
20	0.133	0.286
50	0.333	0.311
100	0.666	0.353
200	1.333	0.436
500	3.333	0.686
1000	6.666	1.103
2000	13.333	1.936

(Times are given in seconds.)

From the table it can be seen that the larger the packet, the greater the advantage. It may be that this mode of transmission is not suitable for use with the existing AX.25 standard, but some sort of alternative protocol could be used (or developed) which will not transmit until it has a certain amount of data to send. (Further discussion about protocols is beyond the scope of this article.)

Remember that these modems are designed to operate within the 3-kHz available on telephone lines and a larger audio bandwidth is normally used on VHF/UHF FM, so the quality on a good path is usually found to be better than that obtained via the telephone system.

The Practice

There are a number of modem devices which can be used for the audio modulation part of a fast RF modem. Connection to a rig can be simple via audio in, audio out and PTT and these modems should be simple to connect to existing TNCs, but I have not tried this yet. So far, I have tried communications using an IBM PC directly controlling the modem and PTT without any rigid packet radio structure as such, but this has proved that the principle at least works on VHF/UHF FM.

All of the modems I have tried have been similar in that they require computer control via a bus which is 8080 microcomputer compatible and have simple audio in and out connections. All that is needed is a dc blocking capacitor between the modem output and the microphone input (some transceivers may also need some attenuation of the signal) and a capacitor from the earphone output of a typical transceiver. A relay should then be driven to control the PTT.

Suitable modems I have tried include the following.

The *R96MD*, which is a V.29 and V.27 modem primarily intended for FAX machines, but it makes an ideal half-duplex data modem. This device is supplied on a small printed circuit board with two rows of pins allowing it to be assembled like a large DIP device. It will operate from 9600 bit/s down to 2400 bit/s, as well as at V.21 at 300 bit/s FSK. DTMF is also provided which may be of use to some amateurs. Because of its application in FAX products, this modem benefits from a reduced cost due to its use in massive volumes.

The *R96MFX* and *R96EFX*, which are CMOS single-chip modems with similar features to the *R96MD*. The *R96EFX* is especially interesting because it has a V.27 short train feature, training in 50 ms instead of the standard 270 ms, and HDLC packetizing and error detection built-in, thus avoiding the need for external HDLC controllers.

We soon plan to try the *R144HD*, which is a V.33 modem that operates at 14,400 bit/s. Again, the modem is designed to operate in a 3-kHz telephone bandwidth, so VHF/UHF operation should not be a problem.

If you would further information, you can leave messages for me at GB3UP (G1NTX @ GB3UP.GBR.EU).

Reference reading:

"Quality of Received Data for Signal Processor Based Modems", application note, *Rockwell 1987 Modem Data Book*. This data book also includes data sheets on all of the modems discussed.

Rockwell Interface Guide. This provides detailed information as to the connection, use and monitoring techniques used for these modems.

by Simon Taylor, G1NTX
from Connect International,
transcribed by Hank Greeb, N8XX (TU HANK)

STRAY BITS

According to David Toth, VE3GYQ, WØRLI PBBS Version 10.06 has been released. According to AMSAT, the MicroSats' launch has been "pushed-back" and is now scheduled for November 9. And according to the Microsoft Word line counter, this is the end.

GATEWAY CONTRIBUTIONS

Submissions for publication in *Gateway* are welcome. You may submit material via the US mail to:

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or electronically, via CompuServe to user ID 70645,247. Via telephone, your editor can be reached on evenings and weekends at 203-879-1348 and he can switch a modem on line to receive text at 300, 1200 or 2400 bit/s.

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